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The Influence of Various Factors on the Progress in Training of International Learners of the Preparatory Department (on the Example of the Course "Computer Science")

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Abstract

The task of research different factors affecting on the progress in training of students is actual. Two main factors as training the course in native language and knowledge of the language in which the course is studied were considered to solve this problem. The research is aimed at learners of the Preparatory Department studying in a non-native language (Russian) and takes into account the characteristics of such contingent of students. The study was made in the course “Computer science” with the help of methods of mathematical statistics. This research was conducted to improve the methods and to change the approaches in teaching the pre-university programs.

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Keywords: International students; factors affecting on the progress in training; methods of mathematical statistics.

1. Introduction

In 2014 Tomsk Polytechnic University (TPU) had some changes in the organization of training for international students of the first and the second years. Basic training, which was held for many years in the department of

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professional training in the Institute of International Education and Language Communication (IIE&LC) of TPU, was reorganized. Because of these changes listeners of the Preparatory Department of IIE&LC enter into the Research and Educational Institutions (REI) of TPU. Thereby time to adapt to the requirements of Russian education for this category of students has abruptly decreased from three years to one year. In these new circumstances the teachers of professional courses have to train international students for a short time so well, that they can pass the exams on these courses in Russian, and study in other institutes of TPU without additional support and adaptation.

At the preparatory department of IIE&LC in TPU international students learn introductory basic courses (mathematics, computer science, physics, chemistry, economics) and Russian language as well. According to the authors, research of the factors that affect on the progress in training of learners studying in non-native language is needed to improve the methods and to change the approaches of pre-university program. As the authors believe, the level of knowledge Russian language and learnt course in native language are very important factors. The question about the impact of these two factors on the success of understanding the course is actual. The international course "Computer science" was chosen for such research. It is difficult to evaluate the level of proficiency in basic computer science concepts of international learners because of insufficiency of Russian language knowledge in pre-university training. Therefore, there was formulated the criterion for research – if the course "Computer science" (or similar course) was studied in native language in the country of residence or wasn't.

2. Methodology

In this paper the impact on the progress in training international learners is investigated. There are two factors: on the one hand, training the course in native language and, on the other, knowledge of the language in which the course is studied.

The aim of this research is to compare if the factors like the level of training in Russian language and the presence of the course "Computer science" at training in native language affect on outcomes of mastering of the course "Computer science" by international learners of the Preparatory Department of IIE&LC enrolled in TPU in 2014 for further correction of the approaches to teaching international learners in future.

Methods of mathematical statistics were used to achieve the aim of the research. In this paper the criterion U Mann-Whitney was used as this test is designed to assess the differences between two selections in terms of any characteristic measured quantitatively (Gmurman, 2003; Gmurman, 2004). This criterion allows to detect differences between small selections when n_1, $n_2 \geq 3$ or $n_1 = 2$, $n_2 \geq 5$. In this case n is the number of people in compared groups, that is $n_1 = 16$, $n_2 = 5$ (Sidorenko, 2002).

In this work the influence of knowledge "Computer science" course and knowledge of Russian language on the progress in studying of international learners of the Preparatory Department of IIE&LC enrolled in TPU in 2014 was compared.

These learners have been studying Russian language for six months and have passed the exam. Then they began to study the core courses. On the course "Computer science" three tests and final credit test were conducted. The maximum score for a test and for credit test is 10 points and the maximum score in Russian language is 5 points. The selection didn't include the learners who has had 5 points on Russian language and has studied the course "Computer science" in native language.

The selection is given in table 1.

Table 1. The selection.

Name	Points in "Computer science"				Points in "Russian Language"	"Computer science" was studied in native language
	Check-point 1 28.01.15	Check-point 2 28.02.15	Check-point 3 23.03.15	Credit test		
Dat	5	6	7	6	3	Yes
An	5	5	7	6	3	Yes
Arizona	7	6	6	7	5	No
Mahboab	8	9	9	10	5	No
Hasha	4	4	2	0	3	Yes
Ismail	8	9	10	9	5	No
Lin	6	8	9	10	5	No
Budsuren	9	10	10	10	3	Yes
Hulan-Erdene	8	9	9	9	3	Yes
Saihanbileg	4	5	8	8	5	No
Dou Czun	9	10	10	10	5	No
Czyan Czun	8	10	9	10	5	No
Saif 1	4	3	3	5	4	No
Saif 2	4	5	7	8	4	No
Den	9	10	10	10	4	No
Kudzai	9	9	10	10	4	No
Bui	5	7	9	10	4	No
Anhzaya	6	6	7	8	4	No
Rafael	9	10	10	10	4	No
Hyuien	7	9	10	10	4	No
Lei Lei	6	8	9	10	4	No

The learners are divided into 2 groups: the first group includes the enrollees who didn't study "Computer science" course in native language and had good or excellent knowledge of Russian language and the second group is the enrollees who studied "Computer science" in native language and had satisfactory knowledge in Russian language. To determine the dependence U Mann-Whitney test was used (Zakharov, 1985; Ivchenko & Medvedev, 2010).

3. Research and results

3.1. The total amount of points received over tests and credit test

It is shown the total amount of all points and corresponding rank for two groups is shown in table 2.

Table 2. Total amount of tests' points and corresponding rank.

Group 1 (n = 16)		Group 2 (n = 5)	
Total score	Rank	Total score	Rank
39	19,5	39	19,5
39	19.5		
39	19,5		
38	17		
37	16		
36	14		
36	14		
36	14		
		35	12
33	10,5		
33	10,5		
31	9		

	27	8		
	26	7		
	25	6		
	24	4,5	24	4,5
			23	3
	15	2		
			10	1
Sum	514	191	131	40
Average	32,125		26,2	

Verifying of correctness of the ranking - the total sum of ranks is:
according to the table

$$\sum R = 191 + 40 = 231$$

and according to the formula

$$\sum R = \frac{21(21+1)}{2} = 231.$$

So the equality of real and calculated sum is true.

Two hypothesis are supposed:

H_0: Group 1 does not exceed group 2 on the basis of the total amount of points received over all tests in the course “Computer science”.

H_1: Group 1 exceeds group 2 on the basis of the total amount of points received over all tests in the course “Computer science”.

Empirical value *U* is determined by formula:

$$U_{emp} = (16 \cdot 5) + \frac{16(16+1)}{2} - 191 = 25.$$

$U_{cr} = 19$ when $p \le 0{,}05$. $U_{cr} = 12$ when $p \le 0{,}01$.

The axis of importance is represented on figure 1.

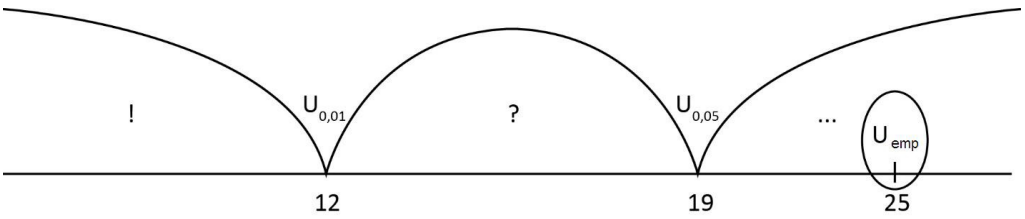

Figure 1. The axis of importance.

$U_{emp} = 25$, $U_{emp} > U_{cr}$. Therefore the hypothesis H_0 is accepted. Group 1 does not exceed group 2 on the basis of the total amount of points received over all tests in the course “Computer science”.

It can be concluded that in given selection the differences between groups are not significant. The learners of Preparatory Department with training in “Computer science” in their native language and in spite of a satisfactory mark in Russian language cope with the training as well as the learners who has good mark or exellent mark in Russian language.

3.2. The total amount of points received only in three tests without points for credit test

The total amount of all points without mark for credit test and corresponding rank for two groups are shown in table 3.

Table 3. Total amount of points and corresponding rank.

	Group 1 (n = 16)		Group 2 (n = 5)	
	Total score	Rank	Total score	Rank
	29	19,5		
	29	19,5		
	29	19,5	29	19,5
	28	17		
	27	15,5		
	27	15,5		
	26	13		
	26	13	26	13
	23	10,5		
	23	10,5		
	21	9		
	19	7,5		
	19	7,5		
			18	6
	17	4,5	17	4,5
	16	3		
	10	1,5	10	1,5
Sum	369	186,5	100	44,5
Average	23,06		20	

Verifying of correctness of the ranking - the total sum of ranks is:

according to the table

$$\sum R = 186{,}5 + 44{,}5 = 231$$

and according to the formula

$$\sum R = \frac{21(21+1)}{2} = 231.$$

So the equality of real and calculated sum is true.

Two hypothesis are supposed:

H_0: Group 1 does not exceed group 2 on the basis of the total amount of points received over three tests in the course “Computer science”.

H_1: Group 1 exceeds group 2 on the basis of the total amount of points received over three tests in the course “Computer science”.

Empirical value U is determined by formula:

$$U_{emp} = (16 \cdot 5) + \frac{16(16+1)}{2} - 186{,}5 = 29{,}5.$$

$U_{cr} = 19$ when $p \le 0{,}05$. $U_{cr} = 12$ when $p \le 0{,}01$.

The axis of importance is represented on figure 2.

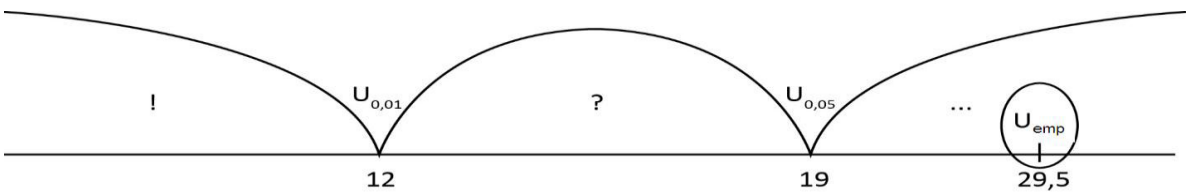

Figure 2. The axis of importance.

$U_{emp} = 29,5$; $U_{emp} > U_{cr}$. Therefore the hypothesis H_0 is accepted. Group 1 does not exceed group 2 on the basis of the total amount of points received over three tests in the course "Computer science".

It can be concluded that in given selection the differences between the groups are not significant. The learners of Preparatory Department with training in "Computer science" in their native language and in spite of a satisfactory mark in Russian language cope with the training as well as the learners who has good mark or exellent mark in Russian language.

3.3. Number of points for credit test only

In table 4 the number of points for credit test and corresponding rank for two groups.

Table 4. Total amount of points and corresponding rank is shown

	Group 1 (n = 16)		Group 2 (n = 5)	
	Points	Rank	Points	Rank
	10	16		
	10	16		
	10	16		
	10	16		
	10	16		
	10	16		
	10	16		
	10	16		
	10	16		
	10	16	10	16
	9	9,5	9	9,5
	8	7		
	8	7		
	8	7		
	7	5		
			6	3,5
			6	3,5
	5	2		
			0	1
Sum	145	197,5	31	33,5
Average	9,06		6,2	

Verifying of correctness of the ranking - the total sum of ranks is:

according to the table

$\sum R = 197,5 + 33,5 = 231$

and according to the formula

$$\sum R = \frac{21(21+1)}{2} = 231.$$

So the equality of real and calculated sum is true.

Two hypothesis are supposed:

H_0: Group 1 does not exceed group 2 on the basis of the number of points received for credit test in the course "Computer science".

H_1: Group 1 exceeds group 2 on the basis of the number of points received for credit test in the course "Computer science".

Empirical value *U* is determined by formula:

$$U_{emp} = (16 \cdot 5) + \frac{16(16+1)}{2} - 197,5 = 18,5 .$$

$U_{cr} = 19$ when $p \le 0,05$. $U_{cr} = 12$ when $p \le 0,01$.

The axis of importance is represented on figure 3.

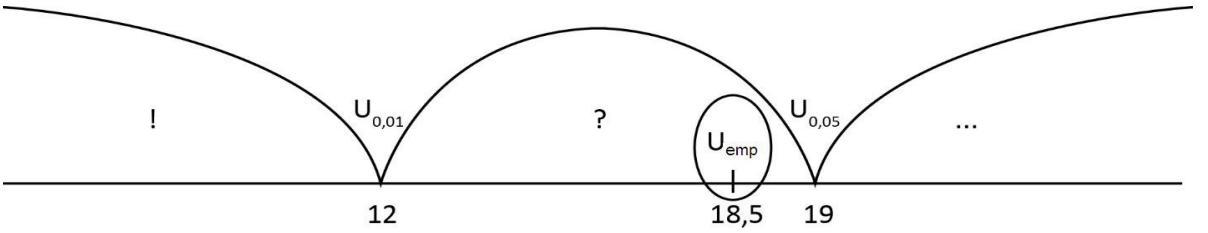

Figure 3. The axis of importance.

$U_{emp} = 18,5$; $U_{emp} < U_{cr}$. Therefore the hypothesis H_0 is rejected and the hypothesis H_1 is accepted. Group 1 exceeds group 2 on the basis of number of points received for credit test in the course “Computer science”.

It can be concluded that the learners of the Preparatory Department not having preparation in the course “Computer science” in their native language and having a good or excellent marks in Russian language pass credit test better than the learners who know Russian language satisfactorily, but got knowledge of “Computer science” course in their native language.

4. Conclusions and recommendations

The research detected the influence of knowledge the “Computer science” course and Russian language for the progress in studying of international learners of the Preparatory Department of IIE&LC in TPU during learning process. Knowledge of Russian language greatly affects on the outcomes of mastering the course "Computer science" when learners pass a credit test.

It is important to use the conducted research for improving of the process of teaching international learners not only the "Computer science" course, but also in other courses.

In conclusion, there are some recommendations helping to improve teaching methods in pre-university program for learners of the Preparatory Department studying in non-native language:

- make a survey on learners about their previous course training in their native language;
- develop different tasks for students with and without training in the course in their native languages;
- create and use electronic resource in Moodle environment of the course for self-guided work of learners.

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